

3. DESIGN

3.5.1.6 Aircraft Hazards

For an early site permit (ESP) application, the NRC staff reviews the applicant's assessment of aircraft hazards to ensure that the risks associated with aircraft hazards are sufficiently low.

3.5.1.6.1 Technical Information in the Application

In Section 2.2.2.6 of the SSAR, the applicant presented information concerning airports and airways in the site vicinity that could affect a nuclear power plant or plants that might be constructed on the proposed ESP site. The applicant evaluated this information in SSAR Section 2.2.3.2.1.

The applicant stated that three airports exist within 15 miles of the proposed ESP site. Two of the airports are paved civil fields at which one or more aircraft are based, and the other is an unpaved private field at which no aircraft are based. None of the airports has commercial operations.

The closest airport is the Lake Anna Airport, about 7 miles south-southeast of the proposed ESP site. According to the applicant, approximately 3640 operations occurred at the field in 2002. The field is occasionally used for practice takeoffs and landings. The other paved field is the Louisa County Airport, which is about 11 miles west-southwest of the proposed ESP site. Approximately 6240 operations occurred at the field in 2002. The third airport is Cub Field, which is about 10 miles south-southwest of the proposed ESP site, and has a few operations per year.

The applicant stated that none of these airports has a sufficient number of flight operations per year to rise above the threshold set forth in Section 3.5.1.6 of Review Standard (RS)-002, "Processing Applications for Early Site Permits," which would trigger a detailed evaluation of potential hazards associated with airport flight operations. Therefore, the applicant did not include a detailed evaluation of potential hazards associated with airport flight operations.

The applicant stated that one civil airway and three military training routes pass near the proposed ESP site. The centerline of the civil airway (V223) is about 5.5 miles west of the site, and the edge of the airway is about 1.5 miles from the site. No traffic data are kept for this airway. However, the applicant stated that the Federal Aviation Administration (FAA) characterizes the airway as "not heavily used" and estimates the traffic to be less than 200 aircraft per day.

The centerlines of the military training routes, which are 10 miles wide, are less than 1 mile south of the proposed ESP site. The applicant stated that the Oceana Naval Air Station in Virginia Beach controls these routes. The applicant added that, according to a knowledgeable representative of the Navy whom it had contacted, pilots using these routes are instructed to fly near the edge of the route to avoid the North Anna Power Station (NAPS) and to generally remain 3 to 4 miles from NAPS. Flights along the routes typically involve one or two aircraft, and rarely four aircraft. The applicant stated that the number of flights per year on the military routes has remained approximately constant, as evidenced by the documented total traffic for

these three routes over a 3-year period. Specifically, the annual number of flights for these three routes was 2582, 2348, and 2623 for the years 1991, 1992, and 1993, respectively.

The airways are sufficiently close to the proposed site to warrant detailed evaluations of the associated potential hazards. In the SSAR, the applicant included detailed evaluations it performed following the guidance in RS-002, Section 3.5.1.6. The applicant's analysis concluded that the probability of an aircraft crash on the proposed ESP site from flights along the V223 airway is 3.45×10^{-8} per year. Similarly, the applicant's analysis concluded that the probability of an aircraft crash on the proposed ESP site from flights along the military training routes is 1.56×10^{-8} per year.

3.5.1.6.2 Regulatory Evaluation

In SSAR Section 1.8, the applicant identified the applicable NRC regulations and guidance related to the identification and evaluation of hazards associated with aircraft hazards as Title 10, Part 100, "Reactor Site Criteria," of the *Code of Federal Regulations* (10 CFR Part 100), Subpart B; Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," issued February 1972; and RS-002, Section 3.5.1.6. Section 2.2.3.2 of the SSAR refers to NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants"; however, RS-002 includes the portion of NUREG-0800 that is referenced. The staff agrees that the foregoing regulations and guidance apply to this portion of the review. The staff considered the regulatory requirement in 10 CFR Part 100, Subpart B, in reviewing aircraft hazards.

According to Section 3.5.1.6 of RS-002, the requirement in 10 CFR 100.20, "Factors to be Considered When Evaluating Sites," that individual and societal risks of potential plant accidents be low is met if the probability of aircraft accidents having the potential for radiological consequences greater than the 10 CFR 50.34(a)(1) exposure guidelines is less than about 10^{-7} per year. The probability is considered to be less than about 10^{-7} per year by inspection if the distances from the site meet all of the following criteria:

1. The site-to-airport distance, D , is between 5 and 10 statute miles, and the projected annual number of operations is less than $500 D^2$; or the site-to-airport distance, D , is greater than 10 statute miles, and the projected annual number of operations is less than $1000 D^2$.
2. The site is at least 5 statute miles from the edge of military training routes, including low-level training routes, except for those associated with a usage greater than 1000 flights per year, or where activities (such as practice bombing) may create an unusual stress situation.
3. The site is at least 2 statute miles beyond the nearest edge of a Federal airway, holding pattern, or approach pattern.

If the above proximity criteria are not met, or if sufficiently hazardous military activities are identified, a detailed review of aircraft hazards should be performed. Section 3.5.1.6 of RS-002 provides guidance on performing such a review.

3.5.1.6.3 Technical Evaluation

The applicant identified three airfields near the proposed ESP site. Two of the three airfields are described as public fields, and the third is identified as a private field. As noted in Section 3.5.1.6.1 of this safety evaluation report (SER), the applicant concluded that none of the fields has a sufficiently large number of flight operations to warrant a detailed analysis of the risk to a plant constructed at the proposed ESP site.

The staff notes, however, that a landing approach holding pattern for the Louisa County Airport is relatively close to the ESP site. Depending on the speed of an aircraft on an approach to the airport, this holding pattern can be less than 2 statute miles from the ESP site. As such, it would not meet the third criterion described in Section 3.5.1.6.2 of this SER. Failure to meet this criterion would, under the guidance in RS-002, necessitate a detailed aircraft hazards review. After consulting with the FAA, the staff has determined that only about 1 percent of all landing approaches to the Louisa County Airport involve the use of this particular holding pattern. Hence, the staff has made an estimate of this hazard by taking into account the above holding pattern usage fraction, the number of annual airport operations (6240 operations per year), the effective target area (0.013 square miles (mi²)), and the crash frequency for general aviation as given in NUREG-0800, Section 3.5.1.6. On this basis, the estimated crash frequency is about 9.7×10^{-9} crashes per year.

The staff has confirmed that the applicant identified the public airfields closest to the proposed ESP site. The next closest public airfield is in Spotsylvania County, more than 20 miles from the site. The staff did not identify any additional private airfields within 10 miles of the site. Given the typical number of flight operations per year from private airfields and the size and type of aircraft that generally use private fields, the staff concludes that a detailed analysis of risk to a plant at the proposed ESP site from operations at private fields is not necessary.

The applicant identified one airway and three military training routes that pass near or over the proposed ESP and, using procedures described in RS-002, Section 3.5.1.6, separately estimated the probability of an aircraft crashing into a plant constructed at the proposed site from aircraft using the airway or military training routes. The staff has reviewed the applicant's calculations and finds them to be consistent with the procedures detailed in RS-002.

In calculating the crash probabilities, the applicant used an effective area of 0.013 mi² for safety-related structures that might be damaged by a crash sufficient to cause the potential for radiological consequences in excess of the 10 CFR 50.34(a)(1) criteria. The applicant used drawings included in the SSAR to estimate this area. The area is somewhat smaller than that listed for the power block (0.018 mi²) in the plant parameter envelope (PPE). The staff considers the area the applicant used in its calculation to be reasonable. Use of either figure for the effective area would result in a crash frequency (for all four routes) of less than 10^{-7} per year.

Appropriately, the applicant used the crash rates per mile of flight included in NUREG-0800 for the calculations. The staff concludes that the probability of an accident having the potential for radiological consequences in excess of the exposure criteria found in 10 CFR 50.34(a)(1) is less than about 10^{-7} per year.

3.5.1.6.4 Conclusions

The staff has reviewed the applicant's aircraft hazard analysis using the procedures set forth in RS-002, Section 3.5.1.6. As set forth above, the staff has independently verified the applicant's assessment of aircraft hazards at the site and concluded that the probability of an accident having the potential for radiological consequences in excess of the exposure criteria found in 10 CFR 50.34(a)(1) is less than about 10^{-7} per year. In addition, equivalent aircraft traffic in equal or closer proximity to plant sites reviewed in past NRC licensing actions was, after careful examination, found to present no undue risk to the safe operation of those plants. Based upon these considerations, the staff concludes that aircraft hazards do not present an undue risk to the health and safety of the public from potential construction and operation of one or more new nuclear plants on the proposed ESP site. Therefore, the staff concludes, with respect to aircraft hazards, that the proposed site is acceptable for constructing a plant falling within the applicant's PPE, and that the site meets the relevant requirements of 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," and 10 CFR Part 100.